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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/936,312	02/12/2002	Antonie Jan Bons	99M006	4062

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ExxonMobil Chemical Company
Law Technology
PO Box 2149
Baytown, TX 77522-2149

EXAMINER

ILDEBRANDO, CHRISTINA A

ART UNIT PAPER NUMBER

1725

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/936,312

Applicant(s)

BONS ET AL.

Examiner

Christina Ildebrando

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,6,7,9-11 and 13-17 is/are rejected.
- 7) ☒ Claim(s) 2-5,8,12 and 18 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 6-7, 9-11, and 14-16 are rejected under 35 U.S.C. 102(b) as being anticipated by WO 97/33684.

WO 97/33684 discloses a process for preparing a molecular sieve membrane. The process comprises (a) depositing on a substrate a monolayer comprising molecular sieve microcrystals which are capable of nucleating the growth of a molecular sieve film (i.e. seed crystals), (b) forming a molecular sieve synthesis solution, and (c) contacting (a) and (b) and hydrothermally growing molecular sieve to form a molecular sieve film on the substrate (page 6).

Suitable substrate materials include porous and non-porous materials such as porous alpha-alumina (pages 10-11). It is taught that the monolayer contains discrete microcrystals of the molecular sieve material (page 9). The composition of the synthesis mixture includes a source of silica such as colloidal silica (page 15). Suitable molecular sieve materials which may be made by the process include MFI type molecular sieve (pages 7-8). It is taught that the crystals are contiguous, i.e. substantially every crystal is in contact with its neighbor, although not necessarily in contact with its neighbor throughout its entire length (page 23). With respect to claim 14, it is the position of the

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examiner that this teaching suggests that at least some of the crystals containing in the layer are non-contiguous. Finally, it is taught that the product is useful as a membrane (page 24).

With reference to the impregnating material claimed herein, the reference further teaches that if the support is porous, before the molecular sieve crystals are applied or before the monolayer structure is contacted with the synthesis solution, the support is treated with a barrier layer (page 18). It is taught that barrier layer may be temporary or permanent (page 19). As a temporary layer, there may be mentioned an impregnating fluid that is capable of being retained in the pores during application of the reaction mixture and which is readily removed after the application and any subsequent treatment (page 19). Suitable temporary barrier layers include water or glycol (page 19). The barrier layer is considered to correspond to the impregnating material claimed herein. The reference does not teach that the barrier layer is carbonized prior to deposition.

With respect to claim 11, the WO reference also teaches that areas of the support upon which is not wanted or needed to form the monolayer and/or the molecular sieve film may be masked before application with a material such as wax (page 19). It is the position of the examiner that the wax would be removed given the final calcination temperatures taught by the reference (page 18).

As each and every element of the claimed invention is taught in the prior art as recited above, the claims are anticipated by WO 97/33684.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 97/33684 as applied above for claims 1, 6-7, 9-11, and 14-16.

The teachings of the WO reference are as described above for claims 1, 6-7, 9-11, and 14-16.

The difference between the reference and the claims is that the reference does not disclose that the impregnation is undertaken for a period of 20 minutes or greater.

However, the reference teaches that the barrier layer functions to prevent the coating mixture or components from preferentially entering the pores of the support to such an extent that the zeolite crystals form a thick gel layer on the support (page 19). It is taught that the barrier layer is contacted with the support such that the material penetrates into the pores of the support material (page 19). One of ordinary skill would recognize that the duration of the contacting step would affect the amount of material that would be able and available to penetrate the pores of the support material.

Therefore, one of ordinary skill would have been motivated to optimize the duration of the impregnation step to form an optimal barrier layer thereby preventing the undesirable formation of a thick gel layer of zeolite crystals, as recognized by the reference. It would have been obvious to one having ordinary skill in the art at the time

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the invention was made to choose the instantly claimed ranges through process optimization, since it has been held that there the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See *In re Boesch*, 205 USPQ 215.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 97/33684 as applied to claims 1, 6-7, 9-11, and 14-16 above, and further in view of Lai.

The teachings of WO 97/33684 are applied as described above for claims 1, 6-7, 9-11, and 14-16.

The difference between the reference and the claims is that the reference does not disclose that the porosity of the support is 30% by volume or greater, as required by claim 13.

Lai (US 5,763,347) discloses a zeolite membrane composition supported on a substrate. Lai teaches that suitable substrate materials include porous and non-porous substrate materials (column 6, lines 24-25). Lai teaches that if the support material is porous, it is preferred that the pore structure and thickness of the support be chosen such that the mass transfer resistance does not limit the flux of the material permeating through the zeolite membrane during use (column 6, lines 35-40). Therefore, it is taught that the porous substrate will display a porosity of preferably about 20 to about 50 % by volume (column 6, lines 35-42). In an example, Lai teaches the use of an alpha alumina support material having a porosity of 32% (column 10, lines 20-25).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process taught by the WO reference to

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include the use of a support having the porosity instantly claimed in light of the teachings of Lai. Lai establishes that the porosity is a result effective variable affecting the rate of mass transfer of the membrane and further suggests that supports having porosities in the range of about 20 to about 50% are suitable. Refer to column 6, lines 35-42 of '347. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ. Because both references are concerned with the production of zeolite membranes useful in the same or similar process of use, one would have reasonable expectation of success from the combination.

Allowable Subject Matter

6. Claims 2-5, 8, 12, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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7. The following is a statement of reasons for the indication of allowable subject matter: Regarding claims 2-5, the prior art of record does not teach or suggest a process for preparing a crystalline molecular sieve layer comprising steps (a) - (c) in combination, wherein the impregnating material in an organic resin, in combination with the other features instantly claimed. Regarding claim 8, the prior art of record does not teach or suggest a process for preparing a crystalline molecular sieve layer, wherein the zeolite seed crystals are deposited prior to the impregnation and the impregnating material substantially fills the pores of the support of the pores of the support and those between the seeds, in combination with the other features instantly claimed. Regarding claim 12, the prior art of record does not teach or suggest a process for preparing a crystalline molecular sieve layer, wherein a pre-impregnation masking material is polymethylmethacrylate, in combination with the other features instantly claimed. Regarding claim 18, the prior art of record does not teach or suggest a process for preparing a molecular sieve layer, wherein the porous support is partially impregnated, in combination with the other features instantly claimed.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


US 6,190,638, US 6,037,292, US 6,051,517, and US 2003/0104925 all disclose zeolite membrane compositions.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Ildebrando whose telephone number is (703) 305-0469. The examiner can normally be reached on Monday-Friday, 7:30-5, with Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.


Christina Ildebrando
Patent Examiner
Art Unit 1725
2/15/03

CAI
September 11, 2003